

HIGH EFFICIENCY ULTRAFAST DIODE

MAIN PRODUCT CHARACTERISTICS

| | |
|----------------|---------------|
| $I_{F(AV)}$ | Up to 2 x 15A |
| V_{RRM} | 200 V |
| T_j (max) | 175 °C |
| V_F (typ) | 0.78 V |
| t_{rr} (typ) | 22 ns |

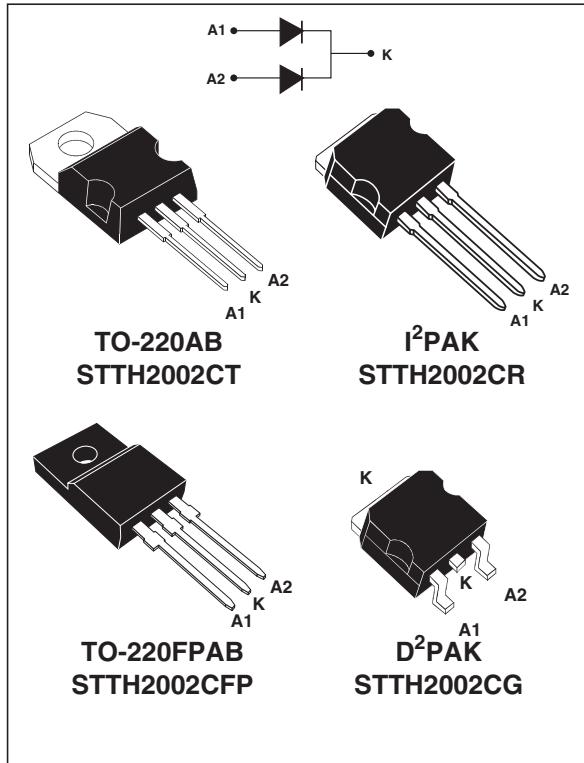
FEATURES AND BENEFITS

- Suited for SMPS
- Low losses
- Low forward and reverse recovery times
- Low leakage current
- High junction temperature
- Insulated package: TO-220FPAB

DESCRIPTION

Dual center tap rectifier suited for Switch Mode Power Supplies and High frequency DC to DC converters.

Packaged in TO-220AB, D²PAK, TO-220FPAB and I²PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.



ABSOLUTE RATINGS (limiting values)

| Symbol | Parameter | | | | Value | Unit | |
|--------------|--|--|---------------------------|------------|------------|------|--|
| V_{RRM} | Repetitive peak reverse voltage | | | | 200 | V | |
| $I_{F(RMS)}$ | RMS forward current | | | | 30 | A | |
| $I_{F(AV)}$ | Average forward current $\delta = 0.5$ | TO-220AB / I ² PAK / D ² PAK | $T_c = 150^\circ\text{C}$ | Per diode | 10 | A | |
| | | | $T_c = 140^\circ\text{C}$ | Per device | 20 | | |
| | | | $T_c = 130^\circ\text{C}$ | Per diode | 15 | | |
| | | | $T_c = 115^\circ\text{C}$ | Per device | 30 | | |
| | TO-220FPAB | | $T_c = 120^\circ\text{C}$ | Per diode | 10 | | |
| | | | $T_c = 95^\circ\text{C}$ | Per device | 20 | | |
| I_{FSM} | Surge non repetitive forward current | | $tp = 10 \text{ ms}$ | Sinusoidal | 90 | A | |
| T_{stg} | Storage temperature range | | | | - 65 + 175 | °C | |
| T_j | Maximum operating junction temperature | | | | 175 | °C | |

STTH2002C

THERMAL PARAMETERS

| Symbol | Parameter | | | Maximum | Unit |
|---------------|------------------|--|--|------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB / I ² PAK / D ² PAK | | Per diode | 2.5 |
| | | | | Per device | 1.6 |
| | TO-220FPAB | | | Per diode | 5 |
| | | | | Per device | 3.8 |
| $R_{th(j-c)}$ | Coupling | TO-220AB / I ² PAK / D ² PAK | | | 0.7 |
| | | TO-220FPAB | | | 2.5 |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode1}) = P(\text{diode1}) \times R_{th(j-c)} \text{ (per diode)} + P(\text{diode2}) \times R_{th(c)}$$

STATIC ELECTRICAL CHARACTERISTICS (per diode)

| Symbol | Parameter | Tests conditions | | Min. | Typ. | Max. | Unit |
|------------|-------------------------|---------------------------|----------------------|------|------|------|---------------|
| I_R^* | Reverse leakage current | $T_j = 25^\circ\text{C}$ | $V_R = V_{RRM}$ | | | 10 | μA |
| | | $T_j = 125^\circ\text{C}$ | | | 6 | 100 | |
| V_F^{**} | Forward voltage drop | $T_j = 25^\circ\text{C}$ | $I_F = 10 \text{ A}$ | | | 1.1 | V |
| | | $T_j = 25^\circ\text{C}$ | $I_F = 20 \text{ A}$ | | | 1.25 | |
| | | $T_j = 150^\circ\text{C}$ | $I_F = 10 \text{ A}$ | | 0.78 | 0.89 | |
| | | $T_j = 150^\circ\text{C}$ | $I_F = 20 \text{ A}$ | | | 1.05 | |

Pulse test: * $t_p = 5\text{ms}$, $\delta < 2\%$

** $t_p = 380\mu\text{s}$, $\delta < 2\%$

To evaluate the maximum conduction losses use the following equation :
 $P = 0.73 \times I_{F(AV)} + 0.016 I_F^2 \text{ (RMS)}$

DYNAMIC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Tests conditions | | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|---------------------------|----------------------|---------------------------------------|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25^\circ\text{C}$ | $I_F = 1 \text{ A}$ | $V_R = 30\text{V}$ | | 22 | 27 | ns |
| | | | | $dI_F/dt = 100 \text{ A}/\mu\text{s}$ | | | | |
| I_{RM} | Reverse recovery current | $T_j = 125^\circ\text{C}$ | $I_F = 10 \text{ A}$ | $V_R = 160\text{V}$ | | 7.0 | 9.0 | A |
| | | | | $dI_F/dt = 200 \text{ A}/\mu\text{s}$ | | | | |
| t_{fr} | Forward recovery time | $T_j = 25^\circ\text{C}$ | $I_F = 10 \text{ A}$ | $dI_F/dt = 100 \text{ A}/\mu\text{s}$ | | | 200 | ns |
| | | | | $V_{FR} = 1.1 \times V_{F\text{max}}$ | | | | |
| V_{FP} | Forward recovery voltage | $T_j = 25^\circ\text{C}$ | $I_F = 10 \text{ A}$ | $dI_F/dt = 100 \text{ A}/\mu\text{s}$ | | 2.4 | | V |

Fig. 1: Peak current versus duty cycle (per diode).

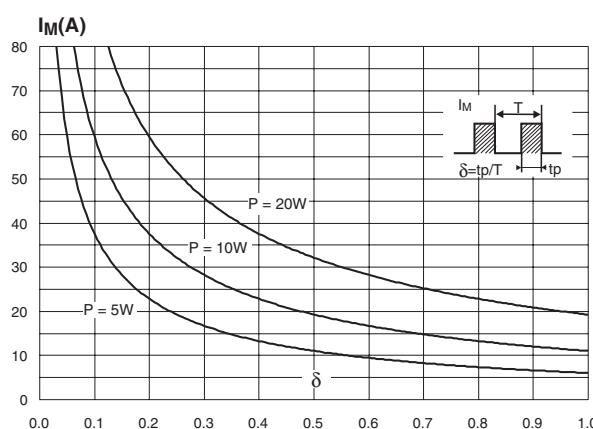


Fig. 2-2: Forward voltage drop versus forward current (maximum values, per diode).

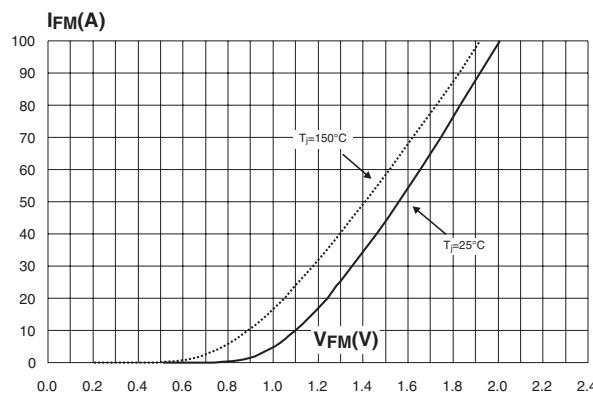


Fig. 3-2: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB).

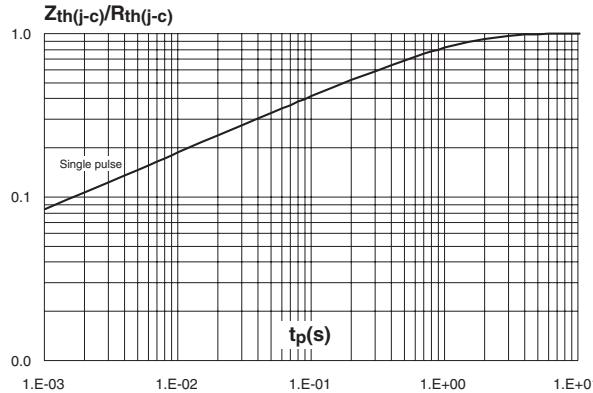


Fig. 2-1: Forward voltage drop versus forward current (typical values, per diode).

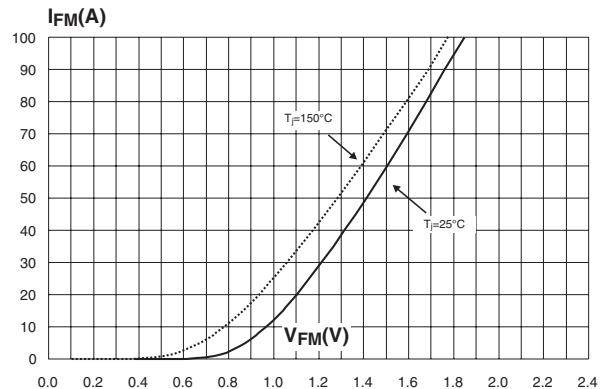


Fig. 3-1: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, I²PAK, D²PAK).

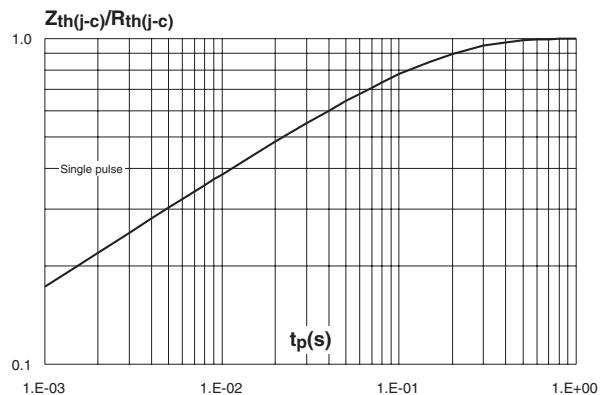


Fig. 4: Junction capacitance versus reverse voltage applied (typical values, per diode).

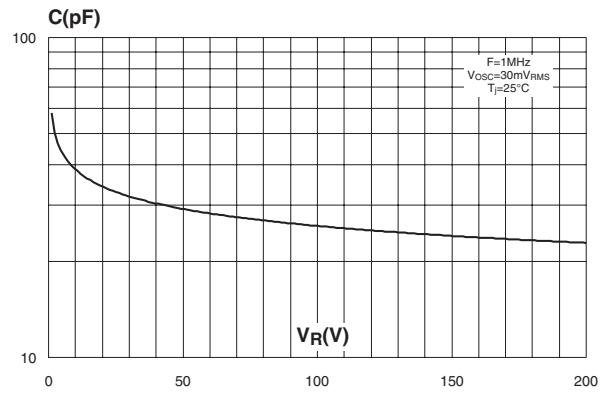


Fig. 5: Reverse recovery charges versus di_F/dt (typical values, per diode).

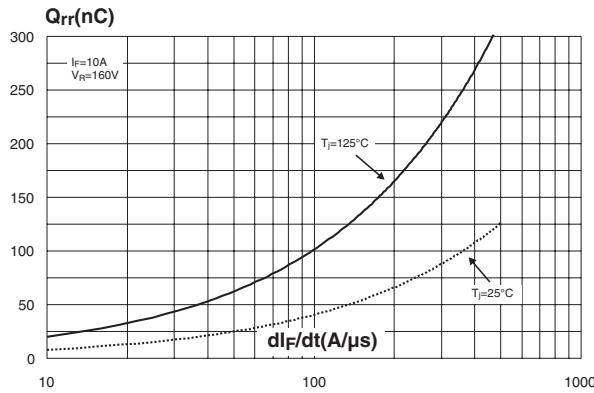


Fig. 7: Peak reverse recovery current versus di_F/dt (typical values, per diode).

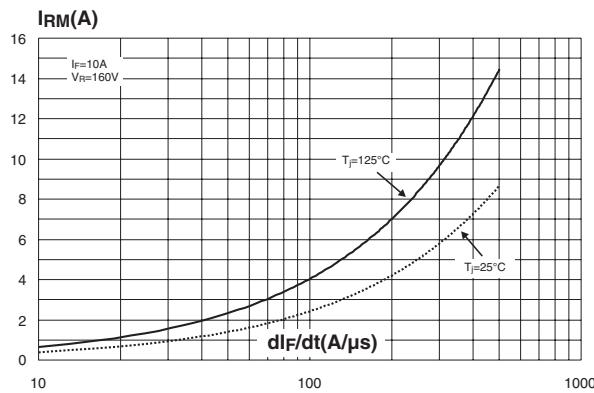


Fig. 9: Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, $ecu: 35\mu m$) for D²PAK.

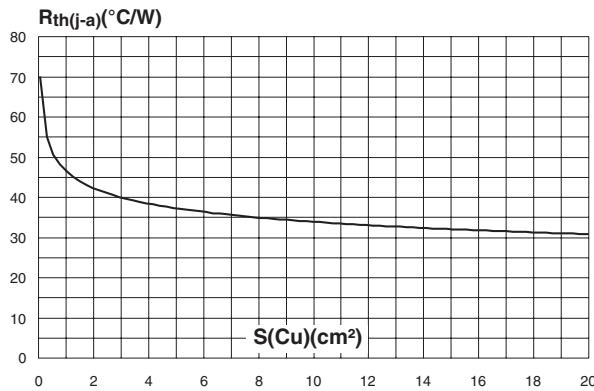


Fig. 6: Reverse recovery time versus di_F/dt (typical values, per diode).

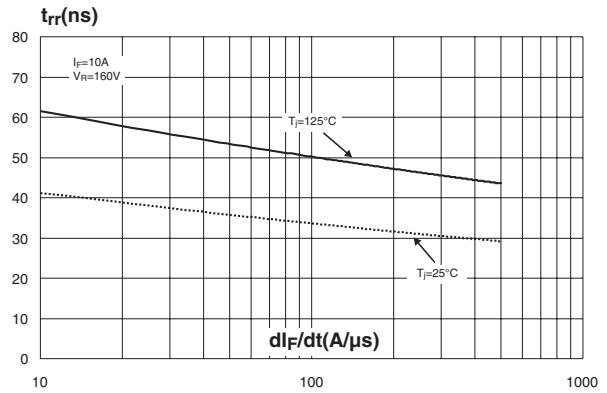
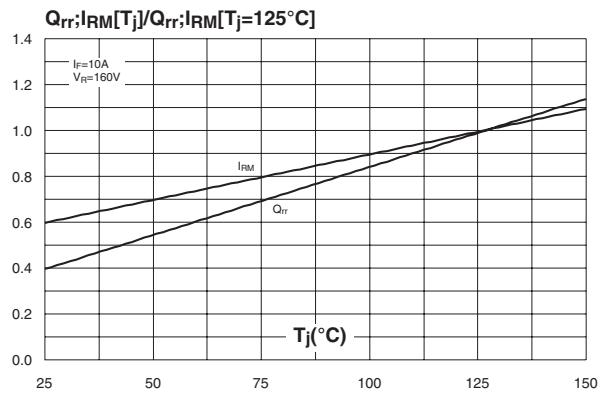


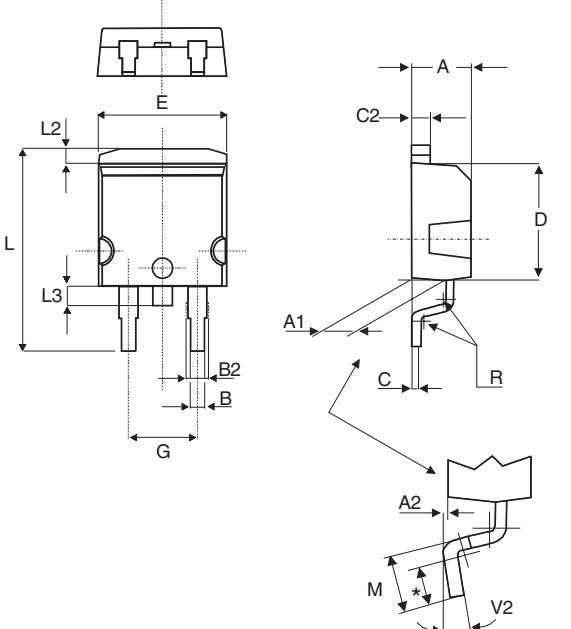
Fig. 8: Dynamic parameters versus junction temperature.



| Ordering code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|-------------|--------------------|--------|----------|---------------|
| STTH2002CT | STTH2002CT | TO-220AB | 2.23 g | 50 | Tube |
| STTH2002CG | STTH2002CG | D ² PAK | 1.48 g | 50 | Tube |
| STTH2002CG-TR | STTH2002CG | D ² PAK | 1.48 g | 1000 | Tape & reel |
| STTH2002CR | STTH2002CR | I ² PAK | 1.49 g | 50 | Tube |
| STTH2002CFP | STTH2002CFP | TO-220FPAB | 1.70g | 50 | Tube |

PACKAGE MECHANICAL DATA

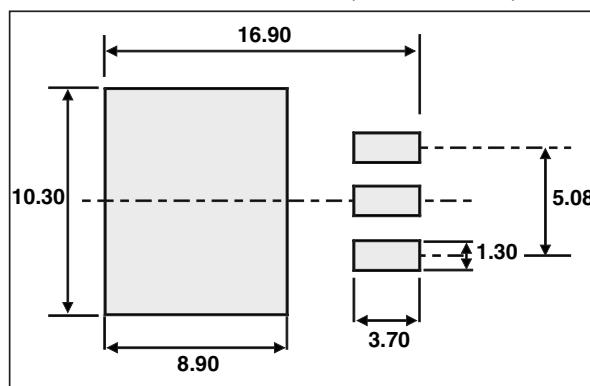
D²PAK



* FLAT ZONE NO LESS THAN 2mm

| REF. | DIMENSIONS | | | |
|------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| A1 | 2.49 | 2.69 | 0.098 | 0.106 |
| A2 | 0.03 | 0.23 | 0.001 | 0.009 |
| B | 0.70 | 0.93 | 0.027 | 0.037 |
| B2 | 1.14 | 1.70 | 0.045 | 0.067 |
| C | 0.45 | 0.60 | 0.017 | 0.024 |
| C2 | 1.23 | 1.36 | 0.048 | 0.054 |
| D | 8.95 | 9.35 | 0.352 | 0.368 |
| E | 10.00 | 10.40 | 0.393 | 0.409 |
| G | 4.88 | 5.28 | 0.192 | 0.208 |
| L | 15.00 | 15.85 | 0.590 | 0.624 |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 |
| L3 | 1.40 | 1.75 | 0.055 | 0.069 |
| M | 2.40 | 3.20 | 0.094 | 0.126 |
| R | 0.40 typ. | | 0.016 typ. | |
| V2 | 0° | 8° | 0° | 8° |

FOOTPRINT DIMENSIONS (in millimeters)

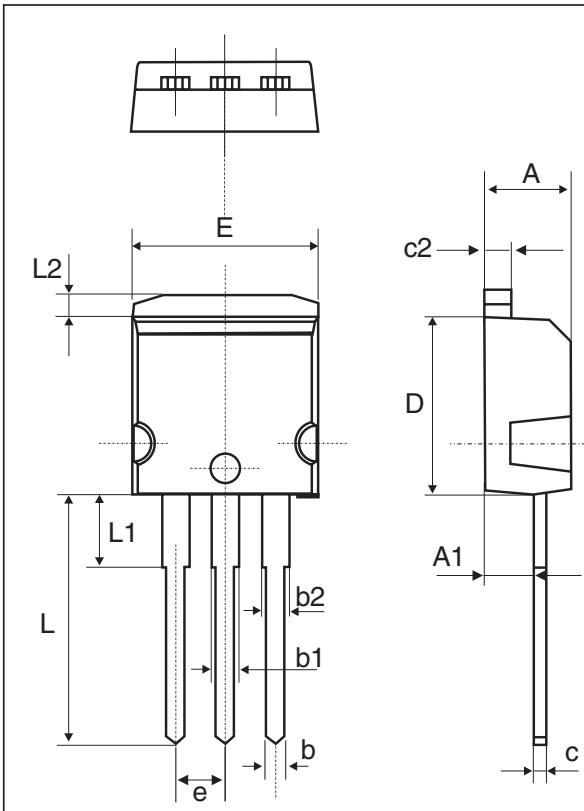




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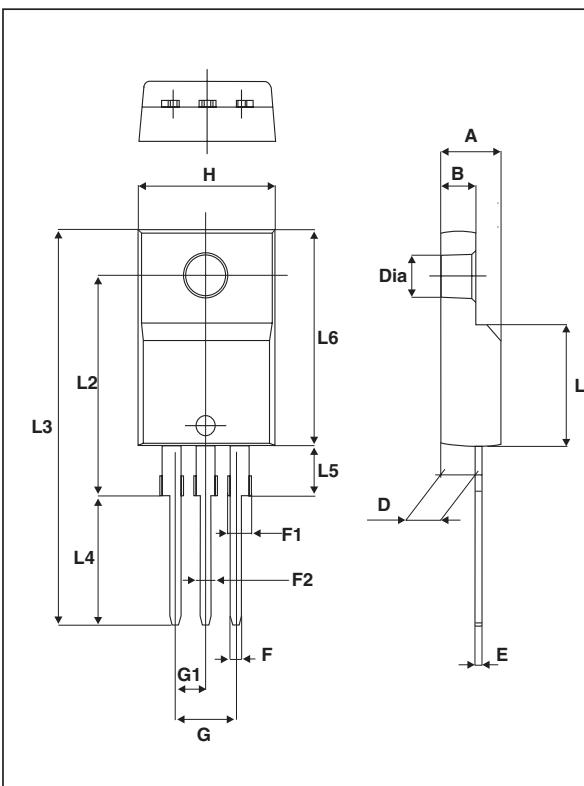
STTH2002C

PACKAGE MECHANICAL DATA I²PAK



| REF. | DIMENSIONS | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| A1 | 2.49 | 2.69 | 0.098 | 0.106 |
| b | 0.70 | 0.93 | 0.028 | 0.037 |
| b1 | 1.14 | 1.17 | 0.044 | 0.046 |
| b2 | 1.14 | 1.17 | 0.044 | 0.046 |
| c | 0.45 | 0.60 | 0.018 | 0.024 |
| c2 | 1.23 | 1.36 | 0.048 | 0.054 |
| D | 8.95 | 9.35 | 0.352 | 0.368 |
| e | 2.40 | 2.70 | 0.094 | 0.106 |
| E | 10.0 | 10.4 | 0.394 | 0.409 |
| L | 13.1 | 13.6 | 0.516 | 0.535 |
| L1 | 3.48 | 3.78 | 0.137 | 0.149 |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 |

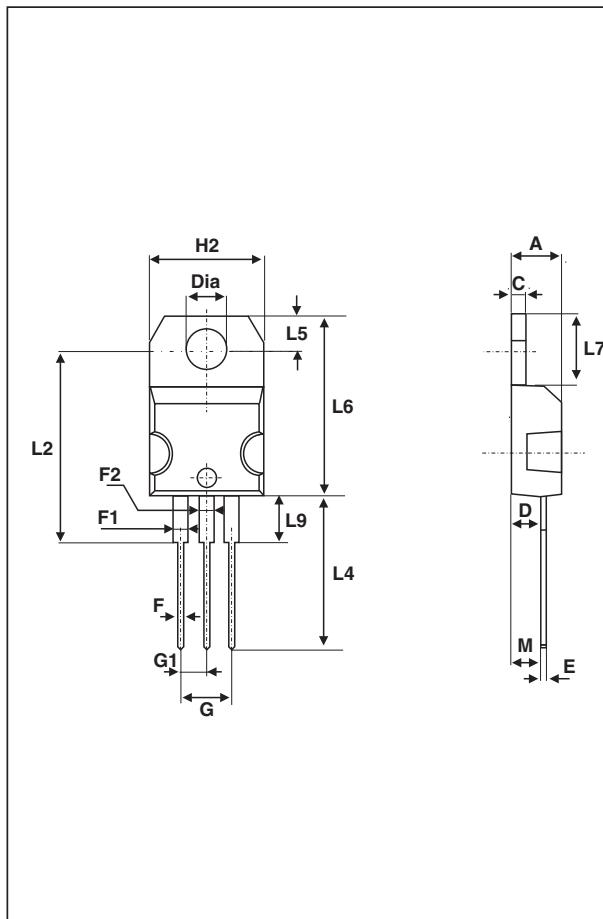
PACKAGE MECHANICAL DATA TO-220FPAB



| REF. | DIMENSIONS | | | |
|------|-------------|------|-----------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| B | 2.5 | 2.7 | 0.098 | 0.106 |
| D | 2.5 | 2.75 | 0.098 | 0.108 |
| E | 0.45 | 0.70 | 0.018 | 0.027 |
| F | 0.75 | 1 | 0.030 | 0.039 |
| F1 | 1.15 | 1.70 | 0.045 | 0.067 |
| F2 | 1.15 | 1.70 | 0.045 | 0.067 |
| G | 4.95 | 5.20 | 0.195 | 0.205 |
| G1 | 2.4 | 2.7 | 0.094 | 0.106 |
| H | 10 | 10.4 | 0.393 | 0.409 |
| L2 | 16 Typ. | | 0.63 Typ. | |
| L3 | 28.6 | 30.6 | 1.126 | 1.205 |
| L4 | 9.8 | 10.6 | 0.386 | 0.417 |
| L5 | 2.9 | 3.6 | 0.114 | 0.142 |
| L6 | 15.9 | 16.4 | 0.626 | 0.646 |
| L7 | 9.00 | 9.30 | 0.354 | 0.366 |
| Dia. | 3.00 | 3.20 | 0.118 | 0.126 |

PACKAGE MECHANICAL DATA

TO-220AB



| REF. | DIMENSIONS | | | |
|-------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| C | 1.23 | 1.32 | 0.048 | 0.051 |
| D | 2.40 | 2.72 | 0.094 | 0.107 |
| E | 0.49 | 0.70 | 0.019 | 0.027 |
| F | 0.61 | 0.88 | 0.024 | 0.034 |
| F1 | 1.14 | 1.70 | 0.044 | 0.066 |
| F2 | 1.14 | 1.70 | 0.044 | 0.066 |
| G | 4.95 | 5.15 | 0.194 | 0.202 |
| G1 | 2.40 | 2.70 | 0.094 | 0.106 |
| H2 | 10 | 10.40 | 0.393 | 0.409 |
| L2 | 16.4 typ. | | 0.645 typ. | |
| L4 | 13 | 14 | 0.511 | 0.551 |
| L5 | 2.65 | 2.95 | 0.104 | 0.116 |
| L6 | 15.25 | 15.75 | 0.600 | 0.620 |
| L7 | 6.20 | 6.60 | 0.244 | 0.259 |
| L9 | 3.50 | 3.93 | 0.137 | 0.154 |
| M | 2.6 typ. | | 0.102 typ. | |
| Diam. | 3.75 | 3.85 | 0.147 | 0.151 |

- Epoxy meets UL94,V0
- Cooling method: by conduction (method C)
- Recommended torque value (TO-220AB): 0.8 N.m.
- Maximum torque value (TO-220AB): 1.0 N.m.
- Recommended torque value (TO-220FPAB): 0.55 N.m.
- Maximum torque value (TO-220FPAB): 0.7 N.m.

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